Apr 4th, 2:00 PM - 2:15 PM

Applying the tools in the marine shoreline design guidelines (MSDG) to select marine bank protection techniques

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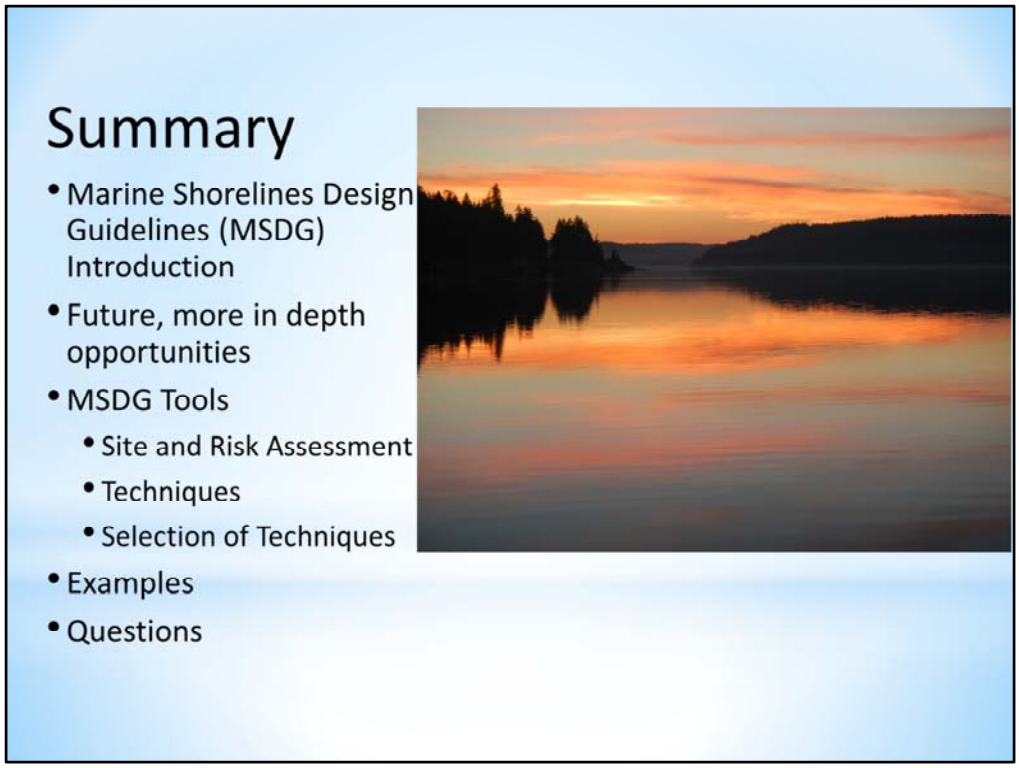
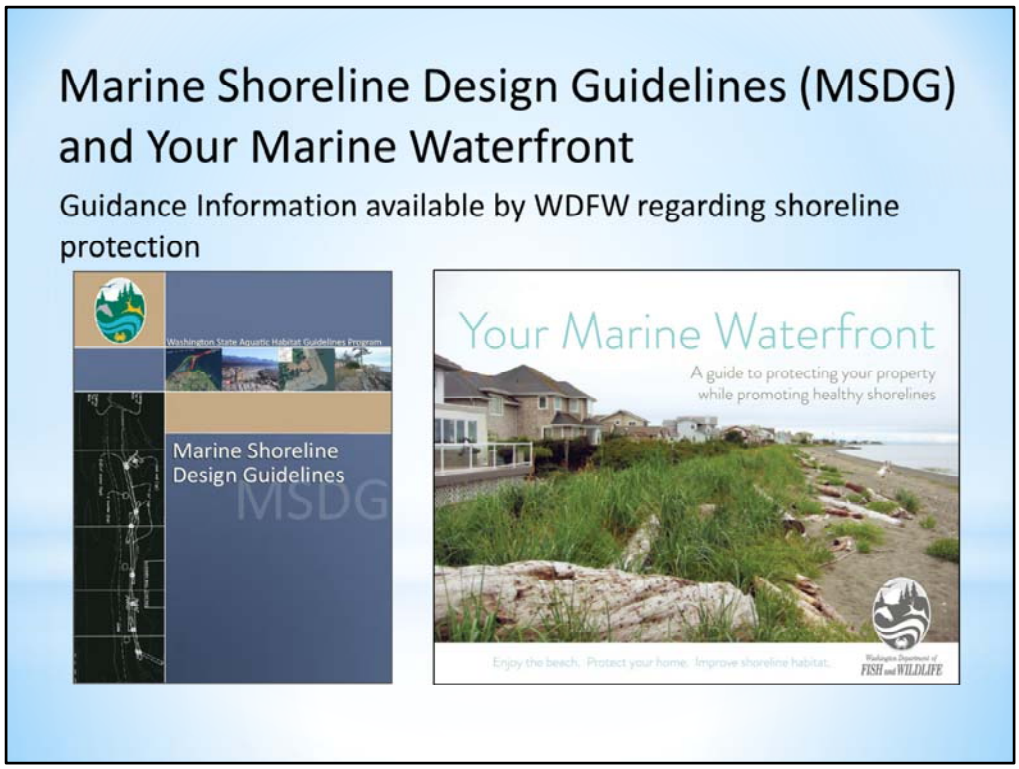
Hi, if I don't already know you, I'm Corey Morss, Habitat Engineer with the Washington Department of Fish and Wildlife. That's a pretty picture of the shoreline at Beach Lake out by the Elwha Mouth on the left, and the photo on the right is some completely useless hard armor that's sitting on the beach at McNeil Island in South Sound. We'd like to avoid things like that, we want people to use the MSDG, and we want to see appropriate designs installed in the appropriate locations. We'll discuss in more detail as we go, but the MSDG is essentially a road map on how to get to the correct approach to shoreline management, including assessment tools. In some cases the result will be hard shoreline protection, but the solution selected should always be the softest viable alternative. I'm going to move through these intro slides pretty quick because our time is quite short. So, what are we going to run through in our 15… now 14 minutes together.



That photo is Hood Canal from Twanoh State Park at sunset. So, here's all the stuff I'm going to cover. I'm going to avoid reading right off of the slides, so, here's the things, and let's jump in.



The MSDG was produced through the Aquatic Habitat Guidelines Program, and made available to the public on the WDFW Website in 2014. To be clear, I was not involved in the development of the guidelines (that was before my time at WDFW), but I do spend a lot of time supporting, and training people on how to use them. As part of this effort WDFW has received a Near Term Action grant to help spread the word, and provide a broader familiarity with how these guidelines can help throughout the Puget Sound… I'm going to avoid going through the guidelines in detail, chapter by chapter, because that's already been done, by Jim and Bob at the 2014 Salish Sea Ecosystem Conference, and during standalone training opportunities. I am going to try to clear up the areas that I have seen as being the most commonly confused in the past couple years acting as the WDFW Shoreline Armor technical assistance guy.

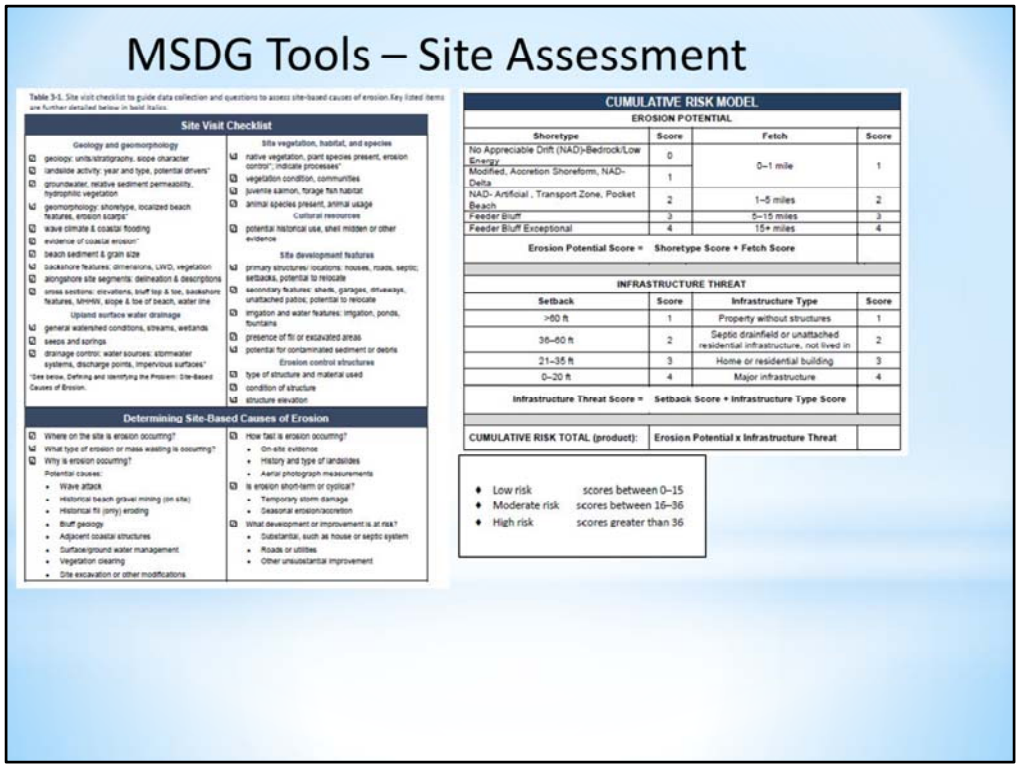
Future Opportunities– Enhancing Regional Technical Capacity Through the Marine Shoreline Design Guidelines

Training and Workshops with follow up site visits.

- State Employees
- Local Folks
- Land Managers
- Planners
- Restoration Practitioners

Following up on these workshops/trainings with technical assistance site visits

The NTA is titled Enhancing Regional Technical Capacity through the marine Shoreline Design Guidelines. The goal is to build familiarity for the resources available in the MSDG to technical and non-technical audiences throughout the Puget sound.
We will be providing trainings for biologists, planners, and other non-engineers on risk assessment and appropriate techniques, including a field component. As well as Interactive workshops for engineers, and other designers on techniques and lessons learned, similarly including field component.
Each event will include follow up site visits to interested parties which will include assessment and recommendations to meet the procedures described in the MSDG. Which is a step that is often overlooked. It seems that often times the answer is ready before the assessment. I'll have cards after the talk, and please feel free to chat with me anytime during the conference to let me know if you're interested in what we're putting together.
Now, let's talk quickly about the tools and techniques available in MSDG and look at what happens when a technique is selected without running through the assessment and selection tools.



Before I start cherry picking areas and portions of the MSDG to touch on, I'd like to caution the user of the MSDG (you guys) to not cherry pick and read the guidelines as a wholistic guide, each chapter builds on the previous chapter, which all feed the discussion on techniques. Chapter 1, Geomorphic Setting of Puget Sound, and Chapter 2, Stewardship, are not only short (about 18 pages of content) but they set the stage for chapter 3, which is where I'm going to start. This chapter covers the broad range of site assessment from remote sensing (coastal atlas, aerial photos, lidar) to physical site observations, and gives a few great references for where to find a lot of that remote sensing data (historical, physical, biological…). The table I've put on the left here is Table 3.1 which shows a good list of areas to emphasize when physically on site. The narrative portions of the MSDG after Table 3.1 discuss the items on the list in detail. Once you've done your remote and onsite recon, you'll head on over to page 19 which is where you'll find Table 3-4 The Cumulative Risk Model, which is the top right on the slide. This is where you'll plug a lot of the data you gather in your recon to come to a level of risk, high, medium, or low. The scores that come out of the cumulative risk model dictate the level of risk, which correlates to the scores on that last picture on the bottom right. Note that this risk assessment is general, and is no substitute for the professional experience of a engineer, or coastal geologist. This sets the stage for the appropriateness of the techniques described in MSDG for Shoreline Protection. Let's run through the techniques that the MSDG discusses in general.

We're going to skip Chapter 4, Coastal Process Assessment, despite it being a critical part of the process. Unfortunately, time is quite limited. So we'll jump right into the techniques in the MSDG. The design of these approaches is described in Chapters 6 and 7. They are broken down into 4 categories: Restoration, Passive Techniques, Soft Techniques, and Hard Armor. Note that while these are separated into different categories and techniques, the majority of projects will use multiple techniques as a solution. Restoration involves no protection at all, rather the removal and restoration of coastal/erosion process, the photos on the top right and top center are an example of that, a bulkhead removal. Passive techniques are those that don't require interacting with the shoreline at all, rather altering the conditions on the slope and area behind the shoreline to minimize the input of water and stabilize the slope biologically. The photo on the bottom left shows a great example of where that would work, concentrated stormwater is chewing away at the bank. The bottom center is a building being relocated which solves the unstable slope issue. Soft techniques, which seem to be all the rage, are a category of shoreline protection that utilizes natural materials (logs, plantings, and gravel) to slow erosion without completely stopping. Often times these techniques are enough to moderate shoreline erosion enough to manage episodic slope failures to an acceptable rate. The top right is an example where beach nourishment was used along with resloping and replanting, and the top middle used large wood set above MHHW to help reduce wave energy and accumulate naturally drifting sediments. Note, natural materials can and often are used to construct hard armor… And the last category is hard armor, specifically revetments and vertical bulkheads. These are hard in that they don't move, and don't give, and are typically constructed out of concrete and angular boulders, but wood and metal are also used. The photo on the top left would

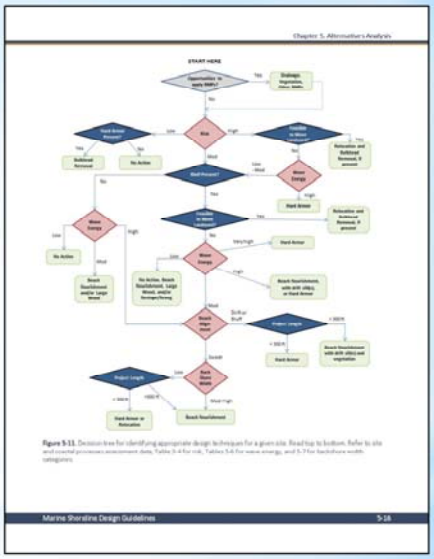
be a concrete bulkhead, and the bottom right is a rock revetment. Now, how do we decide which approach is right?

Selection Tools in MSDG

Table 5-8. Key variables of influence to selecting the appropriate design technique. See Tables 5-6 and 5-7 for wave energy and backshore width categories.

Risk	Wave Energy	Shoretype	Backshore Width	Appropriate Technique
All	All	All	NA	RELOCATION & BMPs
Low	Low to Very high	All	NA	NO ACTION
Low	Low to Very high	All	Low to High	BULKHEAD REMOVAL*
Low to Moderate	Low to Moderate	All	Moderate to High	LARGE WOOD
Low to Moderate	Low to Moderate (drift aligned)	All**	Low to High	BEACH NOURISHMENT
	Low to Very high (swash aligned)	All**	Moderate to High	
Low to Moderate	Low to Moderate	Bluff	Moderate to High	RESLOPE AND REVEG
High	High or Very high	All	Moderate to High	HARD ARMOR REVETMENT
High	Moderate to Very high	All	Low	HARD ARMOR VERTICAL

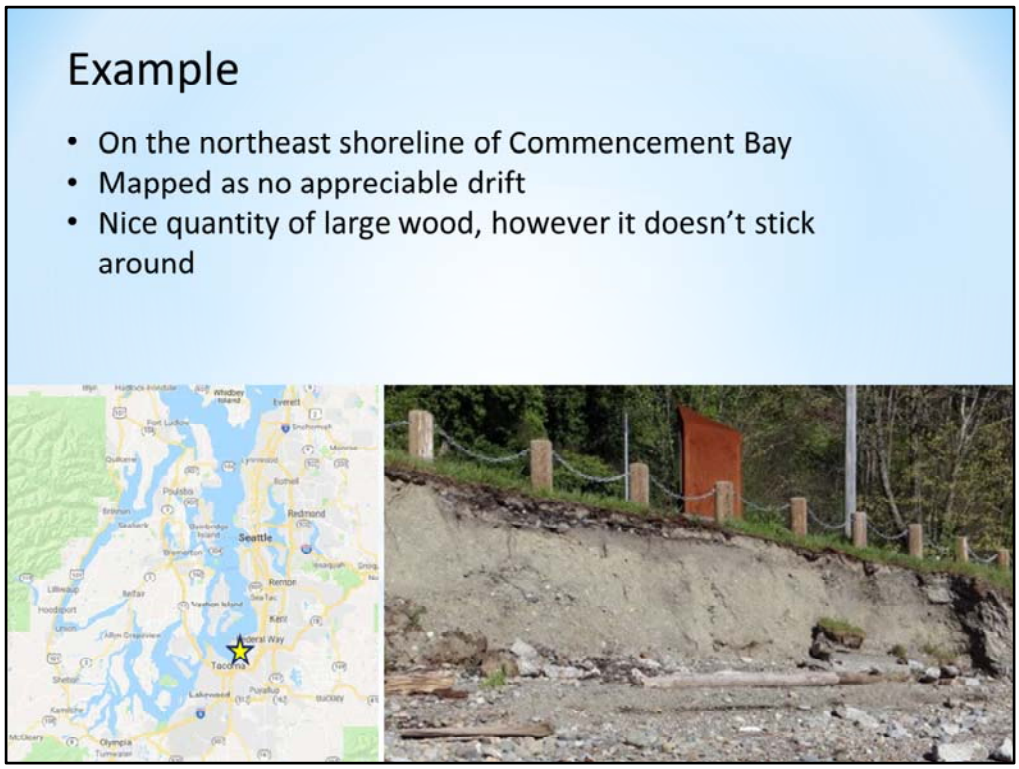
*If not armored then NO ACTION.
**Beach nourishment is only appropriately applied at bluff sites when integrated with other measures including backshore vegetation and an evaluation of littoral drift OR on shores with low wave energy.



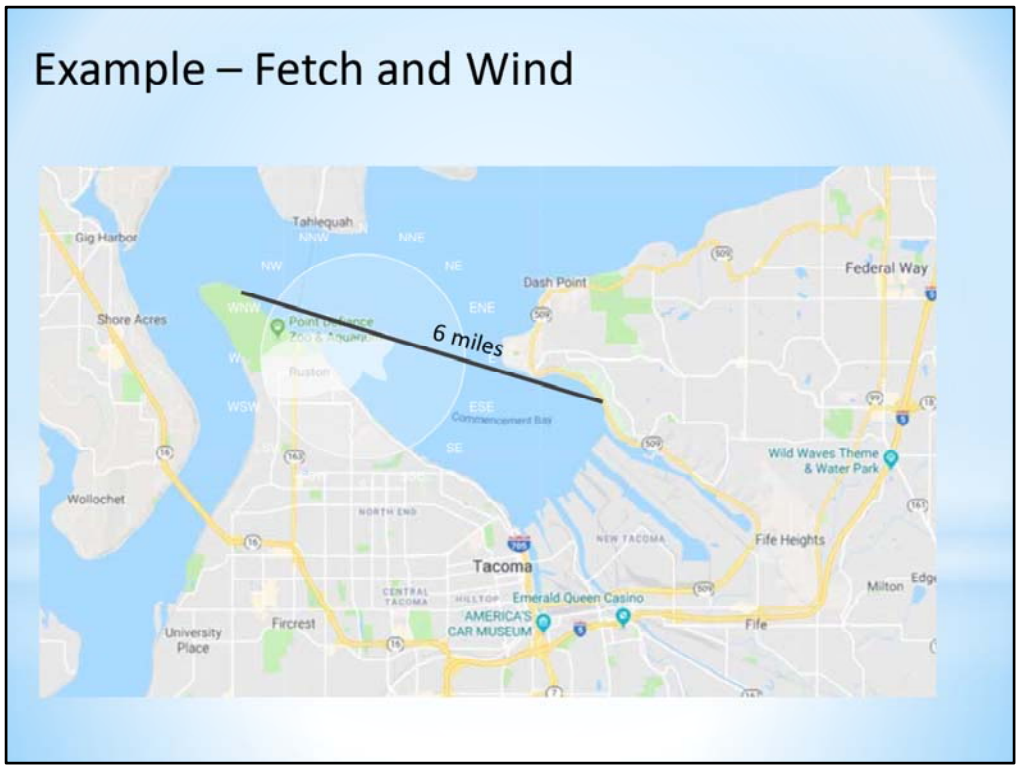
Use the data collected in your site assessment, risk assessment, and coastal process assessment with either:

- Decision Tree (Figure 5-11)
- Technique Selection Table (Table 5-8)

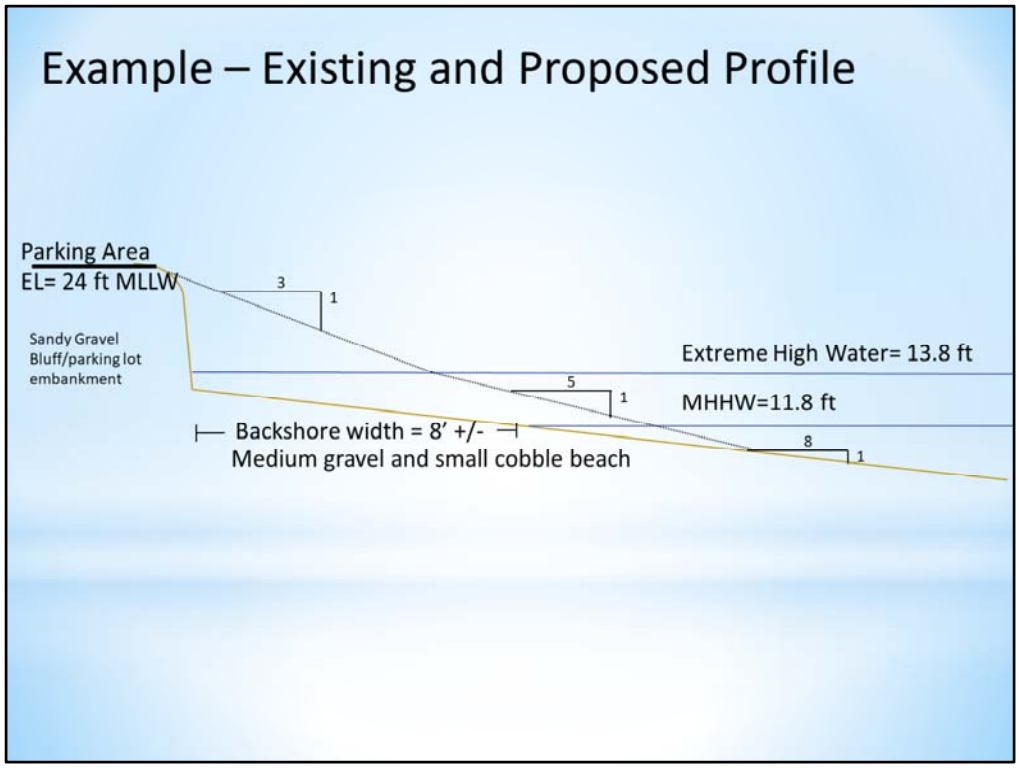
And here's how we recommend selecting which of the previously mentioned techniques are appropriate for your site's conditions. The on the left, Table 5-8, should result in the same solution as if you run through the decision tree on the right there, which is Figure 5-11. Everything builds on itself, the info you get in site assessment should guide you through the risk assessment, which (along with some of the site info) will dictate your path through these approach selection tools and result in a small suite of potential techniques. Now let's take a quick look at what happens when we don't follow the suggested techniques and just pick one of these techniques off the shelf.



This site is in Commencement Bay on the northeast shoreline. I did my best to avoid any identifying information so if you recognize the project, please keep that to yourself for now. Here's an aerial and site photo. The top of the bank is a parking area for a trail with a highway on the other side, and you can see that the slope is near vertical, unstable, and approaching the parking lot which is behind the cable and post fence you see in the picture. So I'm going to gloss over the data collection and give you guys the particulars that drove what we saw on the site.



Here's a closer map showing the worst case fetch, along with a wind rose that is right along that fetch. That fetch distance is about 6 miles, and if you're not familiar with wind roses, the important thing it's telling us is that majority of the winds, and the high intensity winds are coming from the west. Like the previous slide says, there's wood but it's frequently washed away. That fetch distance, and the fact that it's coming from the prevailing winds direction puts us in the high energy category.



Here's a rough profile showing the existing and proposed beach profile generally. The tan is the existing beach, and the dashed black is the proposed profile. You can see there's a pretty short backshore width, and virtually no backbeach with a near vertical existing slope that's 11-12 feet tall. The parking area is set back maybe 2 feet from the top of the slope there. With all the information that you would gather in a detailed site and risk assessment, this shakes out as a high energy, and high risk site.

Appropriate Techniques using MSDG Tools

Figure 5-11. Decision tree for identifying appropriate design techniques for a given site. Read top to bottom. Refer to site and coastal processes assessment data, Table 3-4 for risk, Tables 5-6 for wave energy, and 5-7 for backshore width categories.

Table 5-8. Key variables of influence to selecting the appropriate design technique. See Tables 5-6 and 5-7 for wave energy and backshore width categories.

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Using the tools mentioned a few slides earlier, we ultimately end up with a recommendation for Hard Armor. Like I mentioned earlier, this could also include some soft techniques in concert with the hard armor, but unfortunately at this site the conditions warranted hard approaches to protect this shoreline.

Now, the designer didn't use this approach, and decided that they'd like to do the ecological thing and install some beach nourishment. That's great! We don't like hard armor and beach nourishment is a great approach for moderate risk, moderate energy sites… Note that this picture is in construction, so the entire slope isn't there and the logs aren't in place yet.

2 days later a storm came in and over 3 days the site got 4 inches of rain, along with high winds and tides, and the slope started to disappear. The slope went from 5:1 to 3:1.

Unfortunately, this site would have probably been a good site for hard armor, considering the proximity of the parking area, and the high energy.

I would have really preferred to put in an example about how hard armor went in where it was unnecessary (and not justified by MSDG procedures) and some event came in and made a mess, but that doesn't really happen. The impacts are less visual and much longer term. The moral of the story is to read and use the MSDG to get you to the right place. That concludes my talk, any questions? ….. Please come chat with me and grab my card after the session, or any other time during the conference and I'd be happy to discuss the NTA, how we can get you involved, or just to chat! Thanks